

# ST. MARY DIVERSION FACILITIES DATA REVIEW, PRELIMINARY COST ESTIMATE AND PROPOSED REHABILITATION PLAN

February 11, 2005



*“Lifeline of  
the Hi-line”*



Montana DNRC  
Conservation & Resource  
Development Division

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**TD&H**  
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#### IV. LIST OF ABBREVIATIONS

ACHP	–	Advisory Council on Historic Preservation
ACOE	–	Army Corps of Engineers
AF	–	acre feet – 43,560 cubic feet
AIRFA	–	American Indian Religious Freedom Act
ARPA	–	Archaeological Resources Protection Act
APE	–	area of potential effect
BA	–	biological assessment
BOR	–	U.S. Bureau of Reclamation
CFR	–	Code of Federal Regulations
cfs	–	Cubic feet per second
CIP	–	cast-in-place
CMP	–	corrugated metal pipe
DNRC	–	Department of Natural Resources
DR	–	discipline reports
EA	–	Environmental Assessment
EIS	–	environmental impact statement
EPA	–	Environmental Protection Agency
FONSI	–	finding of no significant impact
F&WCA	–	Fish and Wildlife Coordination Act
GIS	–	geographical information system
GPS	–	global positioning system
HAER	–	Historic American Engineering Record
HDPE	–	high-density polyethylene
H:V	–	horizontal to vertical
IJC	–	International Joint Commission
MEPA	–	Montana Environmental Policy Act
MFWP	–	Montana Fish, Wildlife & Parks

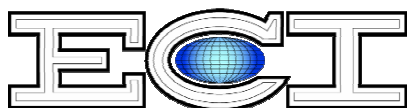
MOU	–	memorandum of understanding
MR&I	–	Municipal, Rural and Industrial
NAGPRA	–	Native American Graves Protection and Repatriation Act
NEPA	–	National Environmental Policy Act
NHPA	–	National Historic Preservation Act
NPS	–	National Park Service
NRCS	–	Natural Resource Conservation Service
NRIS	–	Natural Resource Information Service
NRPH	–	National Register of Historic Places
O&M	–	operations and maintenance
PA	–	Preferred Alternative (for context of this report, PA refers to the overall capacity that the St. Mary River Diversion Facilities will ultimately be rehabilitated)
PER	–	Preliminary engineering report
PVC	–	polyvinyl chloride
RCP	–	reinforced concrete pipe
RFP	–	request for proposals
ROW	–	right-of-way
SCADA	–	Supervisory control and data acquisition
SCS	–	Soil Conservation Service
SHPO	–	State Historic Preservation Office
St.	–	Saint
TD&H	–	Thomas, Dean & Hoskins, Inc.
T&E	–	threatened & endangered
TERO	–	Tribal Employment Rights Ordinance
THPO	–	Tribal Historic Preservation Office
TSEP	–	Treasure State Endowment Program
USFWS	–	United States Fish and Wildlife Service
USGS	–	United States Geological Survey

## V. ACKNOWLEDGEMENTS

This report represents the combined efforts of many individuals and organizations through their input, cooperation and dedication to the overall goal of finding a workable solution towards the rehabilitation of the St. Mary Diversion Facilities. These parties include, but are not limited to, the State of Montana DNRC – Conservation and Resource Development Division, the Blackfeet Nation, the U.S. Bureau of Reclamation – Montana Area Office, and the members and supporters of the St. Mary Rehabilitation Working Group.

This report also represents the combined efforts of our consultant team including ECI – Denver, CO; UMA – Lethbridge, AB; Entranco – Helena, MT and Bellevue, WA; GCM – Butte, MT; Bioeconomics – Missoula, MT; and WestWater Consultants – Corvallis, MT. Although Thomas, Dean & Hoskins is ultimately responsible for the content of this report, it could not have been possible without everyone's technical expertise, experience and enthusiasm for this project.

Much of the background information contained in this report was obtained from many other sources. We have made attempts to credit the sources and ensure accuracy; however, some omissions may exist. For this, we apologize.



## **1.0 EXECUTIVE SUMMARY**

The Milk River is the economic mainstay of North Central Montana from Havre to Glasgow. The majority of Milk River flows, utilized by irrigators, municipalities, and for recreational and wildlife benefits, is diverted from the St. Mary River basin near Glacier National Park into the North Fork of the Milk River via a 90-year old, 29-mile long facility. Separate components include a diversion dam, canal headgates, several inverted siphons, check and wasteway structures, five hydraulic drops, and approximately 29 miles of canal. The diversion facilities are owned and operated by the U.S. Bureau of Reclamation (BOR), and many portions are in danger of failure. Sudden failure would result in severe environmental damage to the Blackfeet Indian Reservation and the St. Mary River or the North Fork of the Milk River and an economic catastrophe for the economies of North Central Montana.

Besides an economic disaster to the irrigators and the State of Montana, a loss of diverted water to the Milk River Basin would also detrimentally impact the following:

- Municipalities that depend on the Milk River as a source of drinking water,
- Ft. Belknap Indian Nation Reserved Water Rights Compact, which is contingent on diverted water,
- State and Federal wildlife refuges and preserves,
- Recreational and fishing facilities along the Milk River and related storage reservoirs,
- Numerous endangered, threatened and proposed species including the Piping Plover (threatened) and Pallied Sturgeon (endangered), which benefit from supplemented Milk River flows, and
- Missouri River flows below the mouth of the Milk River, thereby increasing shortages.

Continued degradation of the diversion and conveyance system has resulted in a diminished capacity. Originally designed to deliver 850 cfs of water during the irrigation season, current capacity is on the order of 670 cfs. Deterioration of the facilities and lack of modernization further impacts operating efficiency and diversion opportunity. Annual water shortages in the Milk River Basin have been well documented. The BOR and the Montana DNRC both agree that

rehabilitation of the St. Mary Facilities back to its original capacity or greater would significantly reduce these shortages.

The diversion facilities lie entirely within the boundaries of the Blackfeet Nation, and as such, they are an important stakeholder. For the last 90 years, environmental issues and concerns, both Tribal and Federal, have arisen regarding the operation of the facilities. For example, the diversion dam precludes passage of bull trout (a threatened species) during operation, and bull trout, as well as other fish species, are permanently lost into the conveyance canal each season. Also, the canal prism and elevated siphons impact elk migration. Improvements are warranted to mitigate these environmental shortcomings, as well as many others.

Since its conception, the Milk River Project, including the St. Mary Diversion Facilities, was authorized by the Federal Government as a single-use irrigation project. As such, the Milk River Project irrigators are obligated by Federal Law to pay nearly 100% of the costs to operate and maintain the facilities through annual assessments on their irrigated lands. Within the last 15 years, maintenance costs, just to maintain a minimum level of service and to avert failure of the system, have escalated commensurate with the accelerating deterioration of the aging facilities. These costs have exceeded the irrigators' maintenance payments and their ability to pay.

The BOR's "North Central Montana Regional Feasibility Report" (BOR, 2004) screened numerous alternatives to reduce water shortages in the Milk River Basin and concluded that the rehabilitation of the St. Mary Diversion Facilities was the most viable option and the only one that would produce positive economic benefits. The following report summarizes the existing studies and background information available on the Facilities, summarizes our site inspections with respect to existing conditions and deficiencies, and presents a Rehabilitation Plan or "roadmap" towards the ultimate goal of overall rehabilitation of the St. Mary Diversion Facilities. This report represents the first step in an iterative process extending through the final phase of construction. The Blackfeet Nation will be an involved party throughout the entire process. The remaining steps are as follows:

- Perform related studies pertaining to slope instability at the St. Mary River Siphon, Basin Hydrology, Economics and Hydropower Feasibility.

- Conduct environmental studies and prepare NEPA compliance documents.
- Evaluate and select the optimum rehabilitated capacity of the Diversion Facilities (referred to in this report as the “Preferred Alternative”).
- Conduct feasibility studies of the major structures comprising the overall facilities.
- Prepare designs and construction documents.
- Construct the recommended rehabilitation improvements.

Due to the preliminary nature of the project, detailed cost estimates are beyond the scope of this report. However, this report does establish a project budget based on a review of existing BOR data. Depending on the rehabilitated canal capacity, (Preferred Alternative), current estimates (updated and revised by TD&H) to rehabilitate the Diversion Facilities range from \$120,000,000 to \$127,000,000 and assume a 2007 construction start date. The current overall project costs are summarized on Tables 1.1 and 1.2 for rehabilitated capacities of 850 cfs and 1000 cfs, respectively. These cost estimates reflect the BOR’s initial or “appraisal-level” efforts for the construction costs developed in 2002 and 2003. It is not the intent of this report to criticize or endorse the BOR’s previous work and reports or pass judgment on the BOR’s design approach or methodologies. In order to identify the Preferred Alternative, it is necessary to summarize existing conditions and deficiencies and review preexisting information and studies. We have provided additional information when prudent so that future decisions can be made effectively. In addition, we believe there are additional alternatives that should be further evaluated during the Feasibility Study phases that would help to reduce the overall construction and design costs, as well as future O&M costs.

Rehabilitation costs will continue to increase, simply from inflation, by  $\pm$  \$3,000,000 per year. Constant and fruitful progress must be made toward this goal to avoid system failure and avert environmental and economic catastrophes.

**TABLE 1.1 OVERALL ESTIAMTED PROJECT COSTS – 850 cfs**

<b>Line Items</b>	<b>Diversion Dam and Headgates</b>	<b>Kennedy Creek Siphon</b>	<b>Kennedy Creek and Wasteway</b>	<b>St. Mary River Siphon</b>	<b>Hall Coulee Siphon</b>	<b>Hydraulic Drops No. 1 – No. 5</b>	<b>Canal Prism Rehab.</b>	<b>TOTALS</b>
Approx. Construction Costs	\$6,608,700	\$504,300	\$849,300	\$4,512,300	\$2,176,500	\$2,351,600	\$32,466,900	\$49,469,600
Inflation Costs <sup>(1)</sup>	\$1,052,600 <sup>(2)</sup>	\$63,300	\$106,600	\$566,300	\$273,200	\$295,200	\$4,074,900	\$6,432,100
Subtotal	\$7,661,300	\$567,600	\$955,900	\$5,078,600	\$2,449,700	\$2,646,800	\$36,541,800	\$55,901,700
Unlisted Items (10%)	\$1,149,200 <sup>(3)</sup>	\$56,800	\$95,600	\$507,900	\$244,900	\$264,700	\$3,654,200	\$5,973,300
Subtotal	\$8,810,500	\$624,400	\$1,051,500	\$5,586,500	\$2,694,600	\$2,911,500	\$40,196,000	\$61,875,000
Contingencies (25%)	\$2,202,600	\$156,100	\$262,900	\$1,396,600	\$673,700	\$727,800	\$10,048,500	\$15,468,200
Subtotal	\$11,013,100	\$780,500	\$1,314,400	\$6,983,100	\$3,368,300	\$3,639,300	\$50,244,500	\$77,343,200
Non-Contract Costs (37%)	\$4,074,900	\$288,700	\$486,400	\$2,583,700	\$1,246,300	\$1,346,600	\$18,590,500	\$28,617,100
Subtotal	\$15,088,000	\$1,069,200	\$1,800,800	\$9,566,800	\$4,614,600	\$4,985,900	\$68,835,000	\$105,960,300
TD&H Recommended Items	\$100,000 <sup>(4)</sup>	\$0	\$50,000 <sup>(4)</sup>	\$0	\$0	\$0	\$7,816,000 <sup>(5)</sup>	\$7,966,000
Subtotal	\$15,188,000	\$1,069,200	\$1,850,800	\$9,566,800	\$4,614,600	\$4,985,900	\$76,651,000	\$113,926,300
Tribal Fees (5%)	\$759,400	\$53,500	\$92,500	\$478,400	\$230,700	\$249,300	\$3,832,500	\$5,696,300
Total Costs per Structure	\$15,947,400	\$1,222,700	\$1,943,300	\$10,045,200	\$4,845,300	\$5,235,200	\$80,483,500	\$119,622,600

Notes: 1. Inflation costs are based on 3% growth rate over 4 years (12.55%), except where noted.

2. Inflation costs are based on 3% growth rate over 5 years (15.93%).

3. 15% used to calculate unlisted items.

4. SCADA

5. SCADA and considerations for canal realignment, relocation, armoring and two-bank construction.

**TABLE 1.2 OVERALL ESTIAMTED PROJECT COSTS – 1000 cfs**

<b>Line Items</b>	<b>Diversion Dam and Headgates</b>	<b>Kennedy Creek Siphon</b>	<b>Kennedy Creek and Wasteway</b>	<b>St. Mary River Siphon</b>	<b>Hall Coulee Siphon</b>	<b>Hydraulic Drops No. 1 – No. 5</b>	<b>Canal Prism Rehab.</b>	<b>TOTALS</b>
Approx. Construction Costs	\$6,956,500	\$663,600	\$913,000	\$6,104,800	\$2,229,600	\$2,431,300	\$33,368,500	\$52,667,300
Inflation Costs <sup>(1)</sup>	\$1,108,000 <sup>(2)</sup>	\$83,200	\$114,600	\$766,200	\$279,800	\$305,200	\$4,188,000	\$6,845,000
Subtotal	\$8,064,500	\$746,800	\$1,027,600	\$6,871,000	\$2,509,400	\$2,736,500	\$37,556,500	\$59,512,300
Unlisted Items (10%)	\$1,209,700 <sup>(3)</sup>	\$74,700	\$102,800	\$687,200	\$251,000	\$273,600	\$3,755,700	\$6,354,700
Subtotal	\$9,274,200	\$821,500	\$1,130,400	\$7,558,200	\$2,760,400	\$3,010,100	\$41,312,200	\$65,867,000
Contingencies (25%)	\$2,318,600	\$205,400	\$282,600	\$1,889,500	\$690,100	\$752,600	\$10,328,100	\$16,466,900
Subtotal	\$11,592,800	\$1,026,900	\$1,413,000	\$9,447,700	\$3,450,500	\$3,762,700	\$51,640,300	\$82,333,900
Non-Contract Costs (37%)	\$4,289,300	\$380,000	\$522,800	\$3,495,600	\$1,276,600	\$1,392,200	\$19,106,800	\$30,463,300
Subtotal	\$15,882,100	\$1,406,900	\$1,935,800	\$12,943,300	\$4,727,100	\$5,154,900	\$70,747,100	\$112,797,200
TD&H Recommended Items	\$100,000 <sup>(4)</sup>	\$0	\$50,000 <sup>(4)</sup>	\$0	\$0	\$0	\$8,038,600 <sup>(5)</sup>	\$8,188,600
Subtotal	\$15,982,100	\$1,406,900	\$1,985,800	\$12,943,300	\$4,727,100	\$5,154,900	\$78,785,700	\$120,985,800
Tribal Fees (5%)	\$779,100	\$70,300	\$99,300	\$647,200	\$236,400	\$257,700	\$3,939,300	\$6,049,300
Total Costs per Structure	\$16,781,200	\$1,477,200	\$2,085,100	\$13,590,500	\$4,963,500	\$5,412,600	\$82,725,000	\$127,035,100

- Notes: 1. Inflation costs are based on 3% growth rate over 4 years (12.55%), except where noted.  
2. Inflation costs are based on 3% growth rate over 5 years (15.93%).  
3. 15% used to calculate unlisted items.  
4. SCADA  
5. SCADA and considerations for canal realignment, relocation, armoring and two-bank construction.



## **2.0 PURPOSE OF STUDY**

### **2.1 PRIMARY OBJECTIVE**

The overall St. Mary Diversion Facility is a large and integrated system comprised of many individual hydraulic structures. Each component is equally important and critical to the diversion, conveyance, and supply of water from the St. Mary River to the Milk River Basin. This diverted water is essential to the economy of North Central Montana from Havre to Glasgow, as well as the remainder of the state. However, the St. Mary Diversion Facilities, of which many of the hydraulic components are nearly 90 years old, are in dire need of immediate rehabilitation to avert failure and avoid economic and environmental catastrophes.

This report focuses on the infrastructure replacement and rehabilitation of the St. Mary Diversion Facilities. Additional analyses of environmental impacts of operation and storage in Fresno are necessary to develop a comprehensive approach. The primary objective of this report is to summarize existing studies and background information available on the facilities, summarize the findings of an independent site inspection with respect to existing conditions and deficiencies, and present a preliminary Rehabilitation Plan for achieving the overall goals of selecting a Preferred Alternative, rehabilitating the diversion facilities and restoring the project as a reliable source of water to North Central Montana.

### **2.2 SCOPE OF WORK**

The State of Montana Department of Natural Resources (DNRC), acting as facilitator on behalf of the St. Mary Rehabilitation Working Group, issued a Request for Proposals (RFP) to develop a “roadmap” or plan towards the primary objective of overall Facility rehabilitation. The scope of work for this first phase includes the three following tasks:

- 1) Review all available engineering, geotechnical and environmental information prepared by the U.S. Department of Interior for the St. Mary Facilities;

- 2) Conduct site inspections of the St. Mary Facilities to identify deficiencies and design concepts for replacement and/or rehabilitation of the St. Mary Facilities;
- 3) Develop a report recommending priority areas of study necessary to identify the preferred alternative, environmental compliance and cultural resource requirements for replacement and/or rehabilitation of the St. Mary Facilities.

For this first phase of work, DNRC established a study area extending from the diversion dam on the St. Mary River to the last hydraulic drop where diverted water joins the North Fork of the Milk River. This report does not specifically address existing conditions and deficiencies upstream of the diversion dam including Lower St. Mary Lake, Swiftcurrent and Boulder Creeks and Sherburne Dam and Reservoir or facilities downstream of the last hydraulic drop such as Fresno Dam and Reservoir. These concerns are outside of the project limits for this study and either are currently being assessed under different studies or will be investigated and evaluated in the future.